

DEPARTMENT OF INDUSTRIES

BOMBAY PRESIDENCY

# ANNUAL REPORT

## 1921-22

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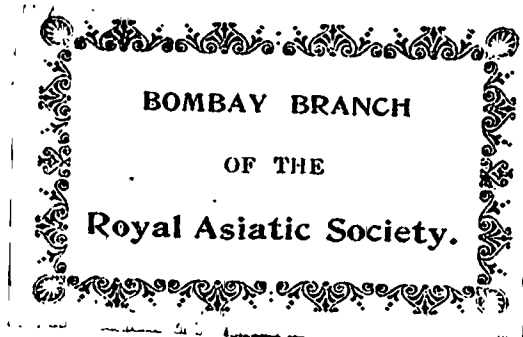
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No. C.—2192/5174.

OFFICE OF THE DIRECTOR OF INDUSTRIES,

Old Customs House :

Bombay, the 5th September 1922

FROM

R. D. BELL, Esq., C.I.E., I.C.S.,

Director of Industries,

Bombay ;

To

THE SECRETARY TO GOVERNMENT,

Revenue Department,

Bombay.

*Annual Report—1921-22*

Sir,

I have the honour to submit the annual report of the Department of Industries for the year 1921-22 (1st August to 31st July).

I have been in charge of the Department throughout the year.

2. This report does not deal with all the duties of the Director of Industries and a brief account is therefore given in this paragraph of other activities which occupied my time during the last year. At the beginning of the year I still held the appointment of Chairman of the Surplus Stores Sales Committee which advised the Government of India regarding the disposal of surplus war stores. This involved no administrative duties but at the end of 1921 I found it difficult to spare a half day each week for the meetings of the Committee and, as the operations had ceased to have any special connection with local industries, I resigned the chairmanship and membership in December 1921. A more onerous duty was the control of the disposal of German

dyes taken over under the reparation clauses of the Peace Treaty. Except a small allotment of a particular class of alizarine dye assigned to the Madras Presidency, all synthetic dyes allotted to India were sold through two firms in Bombay under my supervision. The work had been carefully organised in the preceding year and at first ran on routine lines but, owing to the subsequent slump in prices and confused market conditions, the business later required much attention and seriously interfered with other duties. When the Government of India appointed a Director of Commercial Intelligence at Bombay in the beginning of 1922, I took the opportunity of being relieved of these responsibilities in February last.

3. In December 1921, I assumed control of the amalgamated department for the inspection of factories, boilers and smoke nuisances. For several reasons the supervision of these departments has required an unusual amount of attention lately. The department has been shorthanded and this has led to difficulties and extra work. A scheme for the re-separation and re-organisation of the department has also been prepared. Finally, there has been additional work in connection with the introduction of new factory legislation which came into effect on 1st July and which involved, amongst other things, a complete revision of the rules under the Factories Act. The operations of the amalgamated department are reported in three separate reports for factories, boilers and smoke nuisances, respectively, and no further mention of the work of these departments will be made in this report.

4. Other semi-official duties were connected with the membership of a number of committees. I was a member of the committee appointed under the chairmanship of Sir M. Visveswaraya to frame a scheme for technical and industrial education in the Bombay Presidency. Owing to special circumstances, this membership threw a considerable burden of additional work on myself. I am also a member of the Board of Trustees of the Victoria Jubilee Technical Institute, a member of the Committee of Direction for Technical Education, a member of the Advisory Committee of the College of Engineering, Poona, and a member of the Provincial Co-operative

Conference Committee. The Advisory Committee of the Royal Institute of Science, Bombay, of which I have also been appointed a member, has not yet assembled. The total number of meetings of Committees, including the Sales and Advisory Committees, attended during the year was 54.

5. *Touring.*—Chiefly owing to the work described in the preceding paragraphs it was difficult to leave Bombay during the year except occasionally for short periods. Poona was visited three times for committee meetings and other work. In October I spent a week at Surat and Ahmedabad and in November attended the All-India Hand Weaving Exhibition at Patna. In March and April I made two trips to Calcutta to give evidence and to attend the Industrial Conference and in June visited Poona, Sholapur, Bagalkot and Gadag chiefly to inspect weaving schools and demonstrations.

#### *Expenditure.*

6. The expenditure incurred by the Department during the financial year 1921-22 and the two preceding years has been as follows :—

|         |    |    |    | Rs.      |
|---------|----|----|----|----------|
| 1919-20 | .. | .. | .. | 1,56,000 |
| 1920-21 | .. | .. | .. | 1,46,000 |
| 1921-22 | .. | .. | .. | 1,73,000 |

These amounts do not include expenditure connected with the workshops at Dapuri or the operations of the trawler.

#### *Staff.*

7. Mr. G. H. Thiselton-Dyer joined his appointment as Deputy Director on his return from leave in September 1921. Mr. Thiselton-Dyer was first appointed Deputy Director at the end of 1919 but was required immediately afterwards to act as Director for nine months after which he himself went on leave. The appointment has, therefore, been actively filled only with effect from September last. Up till the middle of June Mr. Thiselton-Dyer made nine visits to Poona and Dapuri extending over 36 days and also visited

Surat, Patna, Calcutta, Nasik, Mahableshwar and Ratnagiri on various duties. His report is appended. (Appendix A.)

Mr. F. E. Bharucha held the appointment of Assistant Director of Industries, Northern Division, Ahmedabad, throughout the year, except for three months (September to December) when he was on leave. During his tours Mr. Bharucha visited Dholka, Kharaghoda, Surat, Viramgam, Anand, Bombay, Poona and Ahmednagar in addition to travelling on work for the Excise Department.

Like myself, these officers have performed duties for Government which hardly come within the scope of this report. The Deputy Director was absent for a fortnight in December on inspection duty in Bengal for the Public Works Department and since the middle of June he has been engaged entirely in advising and assisting the Commissioner of Customs, Salt and Excise. The latter officer also obtained assistance from Mr. Bharucha for a month in making a valuation of the plant of the Dhulia distillery and several liquor warehouses.

The appointment of Executive Engineer in charge of the Central Store and Workshops at Dapuri near Kirkee has been held throughout the year, except for three months when he was on leave, by Mr. F. C. Davies, and the appointment of Works Manager by Mr. C. Holliman who acted as Executive Engineer during Mr. Davies' absence.

Mr. E. R. Fern, Superintendent of Pottery at the Sir J. J. School of Art, served as pottery expert during the whole year.

Mr. A. E. Hefford, whose services were obtained temporarily on loan from the Ministry of Fisheries and Agriculture in England, has held the appointment of Marine Biologist during the period covered by this report. The appointment of Superintendent of Fisheries held by Mr. T. J. Walke was retrenched at the end of March and the appointment of Assistant Marine Biologist which was created in November 1921 was also retrenched in April 1922.

Chemical problems are taken up, in addition to their ordinary duties by Dr. A. N. Meldrum, who was transferred during the year from Ahmedabad to act as Principal of the Royal Institute of Science,

Bombay, and by Mr. A. J. Turner, Principal of the Victoria Jubilee Technical Institute. Mr. C. B. Almoula, B.A., B.Sc., formerly superintendent of the demonstration casein factory at Anand, became assistant to Dr. Meldrum at the beginning of the year while Mr. Turner was again assisted by Mr. M. M. Koppikar, M.A., B.Sc.

*Advisory Committee.*

8. At the beginning of the year, Mr. A. T. Arnall was absent from India and subsequently resigned his membership of the Committee; the vacancy has not yet been filled. At the end of 1921, Mr. Cowasji Jehangir resigned on accepting the appointment of Member of Council. His place was filled by the reappointment of Mr. Purshottamdas Thakoredas. Later, Mr. H. P. W. Macnaghten, the representative of the Chamber of Commerce, Bombay, resigned on proceeding on leave and the Chamber nominated in his stead Mr. N. Birrell. The members of the Committee now are :—

- (1) Director of Industries (Chairman).
- (2) Sir Montagu de P. Webb, Kt., C.I.E., C.B.E.,  
M.L.A.
- (3) Ambalal Sarabhai, Esq.
- (4) Sir Alfred Chatterton, Kt., C.I.E.
- (5) N. Birrell, Esq.
- (6) Lalji Naranji, Esq.
- (7) G. B. Trivedi, Esq., B.A., M.L.C.
- (8) Mangaldas Girdhardas Parekh, Esq., M.L.C.
- (9) Rao Bahadur R. R. Kale, LL.B., M.L.C.
- (10) Mahomedbhoy Currimbhoy, Esq.
- (11) J. B. Petit, Esq., M.L.C.
- (12) Purshottamdas Thakoredas, Esq., C.I.E., M.B.E.,  
M.L.C.
- (13) Vacant by resignation of A. T. Arnall, Esq.

9. At the beginning of the year a statement of the functions of the Committee was approved by Government by which the Director

of Industries is required to consult the Committee in the following matters :—

- (1) The framing of the budget.
- (2) The creation of all new appointments, permanent or temporary, on Rs. 250 per mensem or over, and the conditions as regards qualifications, etc., on which such appointments will be filled.
- (3) The increase in the pay of an appointment of less than Rs. 250 per mensem so as to make it Rs. 250 or more.
- (4) All promotions, apart from sanctioned increments, in appointments on Rs. 250 per mensem or more.
- (5) All schemes or proposals involving an expenditure in any one year of over Rs. 5,000.
- (6) All matters of general policy.
- (7) All matters of public interest.

Where the Advisory Committee and the Director are in agreement, action may be taken by the Director within the powers delegated to him by Government, but where the Advisory Committee and the Director disagree, no action can be taken by the Director in any circumstances without referring the case to Government for their orders. This merely regularised what had been the practice till the beginning of 1920, but it was desirable to give formal recognition to the practice. The Committee is now in close touch with the operations of the Department and it is worth noting that half of the non-official members are also members of the Legislative Council.

10 During the year under report, the number of meetings held was eight and the chief subjects on which the advice of the Committee was tendered to Government were :—

- (1) Report of the Stores Purchase Committee ;
- (2) A scheme for an extension of work on a semi-commercial scale in the Pottery Section of Sir J. J. School of Art ;
- (3) Policy and work of the fisheries section ;
- (4) Participation in the British Industries Fair ;

- (5) The budget of the department for the year 1922-23 ;
- (6) Priority to new industrial concerns for telephone connections ;
- (7) Appointments of Personal Assistant, Deputy Director, Technical Chemist and Circle Officer ;
- (8) Disposal of applications for railway sidings ;
- (9) Cessation of operations of the steam trawler " William Carrick " ;
- (10) British Empire Exhibition ;
- (11) Travelling scholarships for small industrialists ;
- (12) The All-India Hand Weaving Exhibition at Patna ;
- (13) The Government Workshops at Dapuri ;
- (14) Repeal of the Workmen's Breach of Contract Act ;
- (15) Selection of two State Technical Scholars ;
- (16) Railway risk notes ;
- (17) Legislation to restrict transport of cotton ;
- (18) A hand weaving exhibition in Bombay ;
- (19) Compulsory acquisition of land for industrial purposes ;
- (20) Utilisation of fruits, nuts and gum of the cashew tree ;
- (21) A concession for collecting the gum-oleo-resin of *Boswellia Serrata* (Salai).

The Committee received full monthly reports on the operations of the steam trawler.

The Committee also met and had an informal discussion with Dewan Bahadur T. Vijayaraghava Charya, the Indian Commissioner for the British Empire Exhibition.

11. Some of the matters placed before the Committee are again referred to later in this report ; the recommendations made in other cases relate to matters still under the consideration of the Government of Bombay or the Government of India (e.g., Nos. 1, 14, 16, 17 and 19) and require no further mention. It is sufficient to say here that there has been a marked development during the year in the working of the Committee. During my absence on leave in 1920 no meetings were called and this resulted in loss of interest which it

required time to recover. The Committee's functions have now been defined and regular consultation with it is ensured by monthly meetings on fixed dates.

### *Policy..*

12. The year opened amidst marked industrial depression and, although there has since been a tendency to settle down, there has been throughout the whole period a marked lack of confidence in new enterprises. Capitalists are still chary of new adventures and, in the first half of the year, there was a diminution in the requests for information, advice and assistance. Within the last few months interest has been shown in one or two special directions. Purely departmental activities have been restricted by the lack of funds and the main feature of the year's policy has been retrenchment.

### *Cottage Industries.*

13. *Hand-loom Weaving.*—The weaving section of the Department of Industries was first organised by the Registrar of Co-operative Societies and has now been working sufficiently long to give an indication of the possibilities of Government assistance to cottage industries. The object of the weaving section is to raise the standard and increase the amount of the weavers' output by the introduction of improved appliances and methods. There are many types and variations of weaving appliances, but that which has found most favour in this Presidency and has brought the greatest benefit to the weaver is an attachment to the old fashioned throw-shuttle pit loom known as the fly shuttle slay. By means of this contrivance the output of the weaver is increased by at least 40 per cent. Another useful accessory is the mechanical dobby, of which there are several types, for the weaving of patterned cloth. Dobbies suited to the local weaving patterns are supplied by the Department and are now popular. Improved healds, reeds, shuttles and pirns have also been brought to the notice of the weaving community and are in increasing demand.

14. The use of improved appliances is spread in two ways, *viz.*, by means of weaving schools and by weaving demonstrations. The

schools for which local committees are appointed, are equipped with fly-shuttle looms—khadi looms for the beginners and sari looms for the more advanced pupils. The use of other accessories, such as dobbies, is also taught. Instruction is given in the weaving of cotton and mercerised bordered saris, silk saris, dhotis, uparnis, khans, and cloths with intricate designs. Provision is usually made for lessons in simple arithmetic, but in the year under report, all the boys admitted had studied up to vernacular standards III and IV. Less theoretical instruction in advanced weaving was also given as there was a keen demand for hand woven cloth and the boys preferred practice in actual weaving of plain cloth to more advanced work. No fees are charged and for the first three months each pupil receives a monthly stipend of Rs. 3. Thereafter good attendance and workmanship are encouraged by the award of small prizes. By this time, the boys are able to earn a little in the school as the proceeds of their output are paid to them after deduction of the cost of the yarn. They are encouraged to deposit part of their earnings in the Post Office Savings Bank, so that on leaving the school, they can buy a fly-shuttle loom and a dobby and set up for themselves. Registers of old pupils are maintained. Occasionally adult weavers are trained at the school but the first beginnings are invariably made through young boys. It is very difficult to get the adult weaver to change his methods; he naturally loses in quality and output till he acquires proficiency. The young are more easily taught and, when they leave the school, the quality of their workmanship and the rapidity of their working are the best testimonials to the new methods and appliances.

15. At the beginning of the year, there were three schools at Ahmednagar, Yeola (Nasik district) and Belgaum. All these schools met with considerable success. The results at Yeola were particularly gratifying. This school was opened in December 1920 and all kinds of weaving were taught on 20 looms. There is a special prejudice against the fly-shuttle loom for fine work, as the learner naturally finds difficulty at the outset in maintaining the quality which he could turn out with a throw-shuttle. Yeola has a long standing

reputation for fine and costly saris and it is all the more remarkable that during the period the school was open over 600 fly-shuttle looms were introduced. It is the younger generation which has caused the change and children who formerly were engaged in the preparatory processes for their elders are now earning, by the manufacture of silk-bordered saris on fly-shuttle looms, more wages than their parents who cannot break away from their primitive throw-shuttle. At Ahmednagar, over 300 fly-shuttle looms were introduced and at Belgaum about 100. The Kanarese districts have always been difficult to work and the results at Belgaum have only been achieved very slowly and with much effort. These three schools, having done sufficiently good work, were transferred in June last to Bhingar (Ahmednagar district), Nasik and Bagalkot (Bijapur district).

A fourth school was opened at Faizpur early in the year. The ground had been prepared here by a previous demonstration. At the close of the year, 80 fly-shuttle looms had been introduced.

16. During the year, a census of the hand weaving industry was made at Malegaon which was one of the first places in which the use of the fly-shuttle slay was demonstrated. Of 3,700 looms at work, nearly 3,400 were found fitted with fly-shuttle slays; the remainder belonged entirely to old weavers who could not adapt themselves to new conditions. This result illustrates how improved working methods continue to spread in a weaving locality after the school which introduced them has been closed.

Wherever the fly-shuttle slay is introduced in sufficient numbers a subsidiary industry for their manufacture rapidly establishes itself. A committee which recently reported on the weaving schools in the United Provinces, in criticising the attempts of the provincial weaving institute to introduce improved looms and appliances, has recorded that at one town they found that weavers were importing looms all the way from Malegaon and using them as patterns for local manufacture. This town moreover has its own permanent weaving school (established in 1907) of which the same committee recorded that it "has undoubtedly done good work and has earned a

reputation which extends beyond the province ". I mention these facts not so much as a testimony to the work of this department but as an illustration of how the work spreads. The present state of affairs at Malegaon and the spread of the locally manufactured loom is the result of small beginnings ten years ago and steady growth since. The type of fly-shuttle slay, now used by the Department is an improvement on that introduced at Malegaon and still in use there.

17. It is frequently suggested that Government ought to take measures to train agriculturists in spare time occupations and I was requested during the year to make an experiment in this direction. I believe that the amount of spare time available to cultivators and their desire for additional home employment are frequently exaggerated. Further, a difficulty in the way of making such employment remunerative is that a spare time artisan cannot equal the skill of the full-time worker ; this will always increase the difficulty which owing to inexperience, he will meet in the disposal of his output. Cloth is, however, an article which can be used by the weaver himself and his family and for this reason it was suggested to the Agricultural Department that a trial might be made in teaching weaving to agriculturists. For the purposes of the experiment the Agricultural Department selected the village of Hebsur in the Dharwar district. This village was apparently selected because the cultivators belonging to it are already engaged, in addition to agriculture, in the making of gudars or coverings for threshing floors. They will, therefore, probably take more readily to ordinary weaving if this offers any advantages, than the ordinary cultivator. Hebsur can, therefore, hardly be considered a typical case inasmuch as the agriculturists there already have some understanding of the art of weaving. The experiment is however of interest as breaking new ground.

18. The use of improved weaving appliances and methods is also spread by means of demonstrators who travel from one weaving centre to another. Each demonstrator is supplied with two looms, on one of which he works with the appliances which he seeks to introduce among the local weaving population and on the other any

local weaver can receive instruction and practise for himself. Originally, these demonstrations used to last for three or four months, in which period the number of new looms introduced varied from half a dozen to a dozen. In 1919, I found that by extending the period to six months, two dozen looms or more could be introduced. This year the demonstration periods have been further extended, in some cases to a year, and the improvement in results has been very marked in two cases.

19. Six demonstrations were in progress at the beginning of the year at Bhalod (East Khandesh), Erandol (East Khandesh), Poona, Bavdhan (Satara), Talikot (Bijapur) and Guledgud (Bijapur).

The demonstrations in East Khandesh were moderately successful. During the year the demonstrator at Bhalod was transferred to Parola (East Khandesh), while the demonstrator at Erandol was moved to the new weaving school at Faizpur already mentioned. At Poona, where the demonstration will shortly close, about 230 fly-shuttle slays and an equal number of dobbies were introduced. The demonstration at Bavdhan had poor results and was transferred to Karad (Satara District). At Talikot a previous demonstration failed but this year fairly good results were obtained and the demonstrator was under transfer to Nalatwad (Bijapur district) at the close of the year. At Guledgud, where the demonstration still continues, 300 fly-shuttle looms and dobbies were introduced.

A new demonstration was opened at Betgeri (Dharwar district) but results are poor and a change of demonstrators has been arranged. Another new demonstration at Sindikurbet (Belgaum district) did fairly well and was removed at the close of the year to Bail Hongal in the same district.

There has been a distinct improvement this year in the Kanarese districts where results previously have been poor. Both at Guledgud and Sindikurbet there were protests from the local weavers when the demonstrators were transferred.

At the close of the year there were working four schools, seven demonstrations and the special school for agriculturists at Hebsur.

20. The staff under the Weaving Assistant Mr. S. V. Telang has worked very well on the whole but there has been difficulty in retaining assistant masters in weaving schools and in filling vacancies. The assistant masters start as low as Rs. 20 which is much less than can be earned by an efficient weaver. During the last year, when conditions were particularly favourable, silk weavers earned Rs. 50 to 60 monthly and cotton weavers could easily earn Rs. 35. The result has been that it has been impossible to retain efficient assistant weaving masters and some have had to be replaced by incompetent non-weavers who have picked up a little weaving. It is a general weakness of industrial education in this Presidency that the teachers are offered less than the market rates paid to efficient craftsmen.

21. *Experiments in sizing.*—An outstanding requirement of the hand weaving industry is a suitable warping and sizing machine. Three years ago an experimental machine was obtained from Bangalore with the idea of ascertaining its utility for hand loom factories and co-operative societies. I mentioned last year that hitherto its capacity had not been properly tested for want of intelligent handling. This type of machine was awarded the special prize of Rs. 1,100 at the All-India Hand Weaving Exhibition held at Patna in December 1921. After this Exhibition a special demonstrator was engaged for fresh trials and arrangements were made to carry these out under practical conditions in a small weaving works at Ahmedabad. At the same time a second machine of an improved type was ordered.

22. A great deal of interest has been taken in these machines by small factory owners in Gujarat but the results so far can only be described as inconclusive though promising. The demonstrator was inexperienced and the trials on the old machine were a failure in two different factories. The new machine did better in a third factory but at the close of the year operations were suspended in order to send the demonstrator to Bangalore for instruction. It is proposed to transfer the trials now to Surat where tests will also be made of new machines for silk twisting and pirn and bobbin winding. The history

of these experiments illustrates the difficulty of getting competent demonstrators and teachers for this kind of work.

23. *Hand Weaving Exhibition, Patna.*—A reference may be made here to the Bombay exhibit at the All-India Hand Weaving Exhibition held at Patna last December. I wrote an account of the Exhibition which was published in the Journal of Indian Industries and Labour. The awards secured by Bombay were four gold medals, six silver medals, fourteen bronze medals, five certificates of merit and twenty-three ordinary certificates. One of the gold medals was won by a Bombay weaving demonstrator in the weaving competition. He wove 17 yards 22 inches—a total of about 23,000 picks (average 36 per inch)—in 5½ hours. The second man put in 21,000 picks at an average of 42 to the inch. In a special test the Bombay demonstrator put in 128 picks a minute but this was beaten by a Bihar weaver with 144 picks to the minute. These are exceptional results but useful as illustrating the possibilities of the fly-shuttle and its advantages over the throw-shuttle.

The awards gained at Patna by Bombay were the more creditable as I doubt whether any province in India spends less than the Bombay Presidency in assisting the hand weaving industry.

24. *Dyeing and Calico-Printing.*—A dyeing demonstrator was appointed about three years ago but soon resigned owing to the poor salary offered. After sanction had been obtained to a higher rate of pay a new demonstrator was appointed at Ahmedabad in August 1921. After studying local methods and circumstances he endeavoured to interest the local calico printers in improved methods but at first without success. Mr. Bharucha then interested some of the local mill-owners and cloth merchants in the demonstration. An attempt to start a calico printing department in a local mill under adequate supervision failed as the local printers would not submit to mill discipline. A contract for work to be done in their homes was badly executed. Finally, however, the owner of a hand loom factory opened a calico printing department and with the help of the demonstrator has started what seems to be good business. A demand is

ported to be springing up in Bombay for hand woven sarees printed in four or five colours. Given good designs and colours there seems to be room for enterprise here. The Principal of the School of Art has promised assistance by furnishing designs and with well engraved blocks some improvement in the local calico printing industry may be expected. What the hand calico printer achieved in India in the past has recently been shown in the beautiful volumes of Mr. G. P. Baker and it is hoped now to rescue the Ahmedabad craft from the degradation of skill and workmanship into which it has lapsed.

By the close of the year considerable interest had been aroused in this demonstration. Instruction is now given to young men studying at the local Technical Institute or working in local mills and dyers have also come from so far away as Shikarpur and Hyderabad (Sind) to attend the demonstrations.

25. *Casein*.—The research work in connection with casein is described later. At the beginning of the year the small demonstration factory at Anand was closed on account of the appointment of the Supervisor, Mr. C. B. Almoula, B.A., B.Sc., as Assistant Chemist to Dr. A. N. Meldrum. It was re-opened under the charge of Mr. M. T. Shah, B.Sc., in October 1921 and the manufacture of a sample ton for test sale in the London market was undertaken. Actually one and half tons were made but as the earlier production was not so good as later output it was sold to a Calcutta firm. The firm were sufficiently pleased with it to offer large orders, but these could not be undertaken as the scale of the factory is limited to demonstration purposes. Samples were sent to, among others, Sir Frederick Nicholson at Connoor and a firm of casein dealers in Liverpool and favourable reports were received. The sample ton will shortly be sent to London to test the exact commercial value of the improved quality made at the demonstration factory in comparison with the ordinary village production. The casein market was very disorganised during the year.

26. The production of casein is suspended in the Kaira villages during the monsoon as the casein cannot be air dried during damp

weather. A cheap efficient artificial drier would enable production to continue without interruption throughout the year. A machine designed by the Assistant Director was found unsuitable. Another machine is now under construction to a design prepared by the Deputy Director.

27. The Assistant Chemist Mr. Almoula visited some of the principal casein making centres of the Kaira district in order to ascertain what are the obstacles in the way of making good casein in the district. He found that manufacturing conditions were not unfavourable but that market conditions were most discouraging. The local traders make no attempt to maintain a standard either by rejecting inferior casein or by grading according to quality. The result is that the mixed lots which they send to the London market fetch only the price of the worst casein. Locally, therefore, good casein fetches no better a price than bad, and the villagers have no encouragement to take care in manufacture. After the Assistant Chemist's tour village makers inspected the process at the demonstration factory. The Calcutta firm already mentioned is a considerable buyer and has provided a specification which, though not high, nevertheless provides a standard. It is encouraging therefore to report that its local suppliers have introduced in their own factory some of the ideas followed in the Government factory, and that the firm has now approached the department for assistance in standardising and testing their supplies. With the assistance of the Registrar of Co-operative Societies there are now fair prospects of improving the industry.

#### *Technical Advice and Assistance.*

28. For furnishing technical advice and assistance, especially to small and cottage industries, the Deputy Director, Mr. G. H. Thiselton-Dyer, with headquarters at Bombay has been in charge of the Central and Southern Divisions while the Assistant Director, Mr. F. E. Bharucha, with headquarters at Ahmedabad has attended to the Northern Division. No special arrangements were possible for

Sind but in one case the party interested consulted the Assistant Director at Ahmedabad. All cases dealt with by correspondence are included in paragraph 70 and Appendix B.

29. The Deputy Director examined two problems of the gold and silver wire drawing industry at Surat which he visited with me during the absence on leave of the Assistant Director. Attempts to design an improved machine for producing square section spirals were unsuccessful but experiments in manufacturing at Dapuri, steel rolls, had some success. Further reference to this industry is made later. Mr. Thiselton-Dyer also gave attention to some problems of a more general nature. These are described in his report (Appendix A).

30. The Assistant Director gave advice in the following instances to concerns chiefly in Gujarat :—

- (1) design of a chimney,
- (2) repairs to a clarifier,
- (3) scheme for a spinning and weaving mill at Karachi,
- (4) construction of extensions to a spinning and weaving mill,
- (5) erection and working of 150 b.h.p. semi-Diesel oil engine,
- (6) suggestions for improved working of two power plants,
- (7) foundations for new oil mills,
- (8) introduction of super heaters,
- (9) scheme for a ginning factory,
- (10) construction of a pottery,
- (11) remedy for a cracked steam pipe,
- (12) cooling and humidifying arrangements in a textile factory,
- (13) repairs to a wash pump, and
- (14) utilisation of heat in chimney flues for preparatory heating in a chemical factory.

31. The object of the department in this branch of its operations is to assist small industries to introduce improved plant and methods and to show them how to work efficiently so as to secure an improved and increased output. There are special difficulties connected with the work of this kind one of which appears in the programme carried out by the Assistant Director. It is not always easy to decide whether an industrial concern requires or deserves free state help of this kind, whether it may be afforded assistance on payment of suitable fees, or whether it should be required to make its own arrangements. Without discussing general principles I may merely state that in the Northern Division there has been a tendency for well-to-do concerns to seek and obtain the advice of the Assistant Director apparently for the reason that it cost them nothing. In the other two divisions little was done directly to ascertain the difficulties and needs of the smaller industries. The work recorded in this section is therefore disappointing both in amount and kind. The task is not an easy one but the difficulties will not be overcome unless the officers entrusted with it get into actual touch with industries especially the smaller concerns. I propose, when the department is reorganised, to utilise the factory and boiler inspection staffs, not for the purpose of giving technical advice and assistance, but for intelligence purposes so that the needs and difficulties of industries, which are not now the direct concern of the inspectors, may be brought to the attention of the Director.

32. It was found hopeless, at present, to revive the scheme for the small dyeing factory at Malegaon which was mentioned in last year's report as having been frustrated by non-co-operators.

33. *Small pumps and motors.*—At the instance of Sir Alfred Chatterton steps were taken to engage the interest of engineering firms in the problem of improved irrigation from wells in India. There is no difficulty about raising water from wells by mechanical means when the quantity of water to be lifted is large but for a two thousand gallons per hour supply there is nothing at present suitable to replace bullock power. There must be designed first, a suitable

pump and, secondly, to work the pump, a simple and reliable motor of about two horse power. The Deputy Director reports that he has made progress with a design for a cheap pump but a problem of this kind is not likely to be quickly and completely solved by an individual. The representatives of British engineering firms were therefore invited to meet Sir Alfred Chatterton to hear his views and discuss them. A full account of the discussion was published in the local press. British firms are now working on the combined problem.

34. As regards the motor, increased attention is being given to the possibilities of the suction gas producer and the gas engine: English firms are working on these lines and Messrs. Kirloskar Brothers, agricultural implements manufacturers, Satara District, are also taking up the manufacture of such plant. The charcoal supplies available for use with producers have also been considered and will probably be further examined by the Forest Department.

35. *Improved ploughs and other agricultural implements.*—A problem which, like the last, constitutes a link with the Agricultural Department is the manufacture of iron ploughs suitable for different tracts and soils. In connection with complaints regarding the short life of plough shares used with improved ploughs the Deputy Director demonstrated that the chilled shares made by Kirloskar Brothers are quite equal to those imported from England and the United States of America while they cost much less. The problems connected with improved ploughs and other agricultural implements were referred to a committee over which I presided in June last. Its recommendations are now under the consideration of Government.

#### *Chemical Research.*

36. Owing to the absence of new industrial enterprise and the need of practising economy throughout the year, there were no fresh developments in chemical research,

37. *Casein.*—This investigation was fully described in last year's report. During the year the casein manufactured at the

demonstration factory, Anand, was regularly analysed by the Assistant Chemist and the analytical results utilised in controlling manufacture. As the acidity of casein was found to fluctuate experiments were arranged to follow the increase of acidity during fermentation and to ascertain what is the degree of acidity which leads to complete precipitation of casein.

38. At the close of the year a communication was received from the Director of the Imperial Institute, London, with reference to the views expressed in their second bulletin by Dr. Meldrum and Mr. Gangolli regarding the best method of determining fat in casein and their criticisms of results obtained at the Imperial Institute. The Imperial Institute has not accepted the conclusions of the local investigators, but further information, which has been promised, must be awaited before the question can be further examined.

39. The work hitherto undertaken at Ahmedabad and Anand has been directed towards the manufacture of an improved lactic casein. As mentioned in paragraph 25, the commercial value of the improvement achieved has still to be ascertained. There is however probably a better market for rennet casein which is now much used in Europe and America for the manufacture of "artificial ivory" and substitutes for celluloid. Research work on rennet casein has therefore been begun and the first experiments are encouraging. Instead of animal rennet, vegetable rennets, for the supply of which I am indebted to officials all over India, are being used.

40. Experiments were made on the production of casein glue for use in the Madras Pencil Factory and several samples according to different formulæ have been tested at the factory. Three samples were found to be suitable. Principal R. S. Cree-Brown of the College of Engineering, Poona, kindly provided a design for a testing machine and this is now under construction. This will enable glues to be tested here when they are made. For the purposes of this enquiry a scholarship in technical chemistry has been awarded to Mr. M. H. Ghadiali, B.Sc.

41. Casein is also a valuable material in the manufacture of paints and varnishes and its use for these purposes will be investigated by Mr. Turner.

42. *Magnesium Chloride*.—The magnesium chloride produced at Kharaghoda by the Pioneer Magnesia Works from the bitterns or mother liquors of the salt works shows discolouration when the crystals are fused preparatory to running the material into the drums in which it is sold. The quality of the chemical is quite satisfactory and is not affected by the discolouration but the superior white appearance of the imported chemical naturally secures it preference from the cotton mills, which use it in large quantities for sizing purposes. It is unnecessary to describe in detail the work done as all efforts to remove the discolouration have failed. The problem is also under investigation by Drs. Sudborough and Watson at the Indian Institute of Science, Bangalore. Other chemists have also given consideration to the matter. No one has found a solution and there are as many opinions regarding the cause of the discolouration as there have been investigators. It is however only by persistent labour on problems of this kind that full use can be made of the country's natural resources.

43. *Sind Soda* (Trona).—The object of these experiments which were instituted at the suggestion of Mr. G. de P. Cotter of the Geological Survey of India who surveyed the alkali deposits in Sind in 1918-19 is to improve the production of *chaniho* so as to procure the mineral "trona"—a combination of sodium carbonate and bicarbonate—in a fairly pure form. The local authorities carried out the experiments very well but misunderstood the limits imposed by natural causes. Mr. Koppikar visited Sind in April last and the impracticability under the local conditions of producing pure sodium carbonate is now understood. Good "trona" is a perfectly satisfactory substitute for soda ash in all its local uses but whether it can replace it on the market remains to be seen. The soda ash trade is well organised and a standardised product has, at all times, obvious advantages.

44. The miscellaneous work of Messrs. Meldrum and Turner consisted of examination and analyses of mineral and vegetable oils, waters, casein, butter, nettalene, tetralene, coals and coke. Mr. Turner also investigated the sugar content of cashew nuts and dealt with a number of miscellaneous enquiries.

### *Pottery.*

45. Mr. E. R. Fern was in charge of the Pottery department of the School of Art, Bombay, throughout the year. Twelve students were under instruction.

Experiments in the manufacture of brown teapots were continued from last year and brought to a successful conclusion. White earthenware cups, saucers and teapots were also made experimentally. The scheme for the production of flooring tiles and teapots on a semi-commercial scale was sanctioned during the year but owing to the provision of funds being doubtful, the plant required could not be ordered till May and actual production has therefore been delayed. Work on the new kiln has, however, been commenced and 100 tons of Kirol clay have been stocked and are being levigated. It is hoped that output will commence before the end of the year.

46. Further work was done on behalf of the Development Directorate. Mr. Fern visited the clay beds at Trombay and Kalyan and the brick factory at Vasing and submitted reports. Five hundred red bricks were also prepared for the Directorate from mixtures composed of 58 samples of clay from the brick area acquired at Kalyan. Ninety-three experiments were made with these clays and for the final test a kiln of 500 bricks was prepared. This represented a good deal of work but the result satisfied the Superintending Engineer, No. IV Project Division, that very good bricks can be made of Kalyan clay with appropriate machinery and expert supervision.

47. Other work at the School of Art included 25 experiments in the manufacture of pipes for the chemical industry. They were all more or less successful and two of the tests have been selected to

produce pipes of a useable size for a final test at the Cordite Factory, Aravankadu. Majolica glazed palm pots in artistic colours were also produced and 48 test trials were made for various coloured glazes. The vases were produced in some of the colours tested and were exhibited to the public. Experiments in the use of waste mica were unsuccessful.

48. Mr. Fern visited two pottery factories at the request of the owners and gave advice to 24 persons who called at his workshops in connection with pottery manufacture. One hundred and two samples of clays were received for testing and report, of which 90 samples were investigated and reported on during the year. Mr. Fern has done a great deal of valuable work in this way since he was attached to this Department, but the easy terms on which it is carried out seems merely to encourage the submission of samples by persons who have no very serious intention of proceeding further in the matter whatever the results may be. It is proposed, therefore, in future not to allow free investigation except in very special cases. The fees received during the year under report on account of testing and analyses of clays amounted to only Rs. 195.

### *Fisheries.*

49. *Trawling*.—The steam trawler “William Carrick” made its first voyage in May 1921. In November the results up to date were summarised and placed before the Advisory Committee for its consideration. It was then apparent that trawling was not yet a commercial proposition in Bombay waters. The Committee, by a majority, recommended, however, that the experiment should be continued till the end of May 1922 in order that the results of a full season’s fishing might be available as data in the future. The recommendation was based on the ground that the financial and other factors governing the commercial prospects of trawling, e.g., local market conditions, the prices of fish, the price of coal and other stores, and the facilities for rapid removal and cold storage of the

catch, for carrying out repairs and for supplying coal, ice, etc., might change in the future, but would-be investors would always require data regarding the rate at which fish could be caught all the year round. Government decided, however, that the experiment should be closed before the end of the financial year. In order to close the accounts in time the vessel returned to Bombay from the 36th and last voyage on 27th February. Two days were occupied in landing the catch and a few more days in checking stores and preparations for laying up. The vessel was finally laid up on 9th March and the four European officers left Bombay for England via Karachi the following morning. The vessel was sold in May to the Government of Burma.

50. At the outset the results seemed promising. It took a little time to train the local crew but, taking results per hour's trawling there was a regular and rapid increase in the catches up the seventh voyage at the end of July and it seemed that trawling might, subject to certain conditions, be a feasible commercial proposition. These conditions will be discussed below. The seventh voyage was the third under monsoon conditions and as these became established trawling became more difficult and, at times, impracticable. There was violent weather from the end of July till the second week of September (7th to 13th voyages) resulting in loss of time and damage to nets. There was also considerable sickness among the crew, both European and Indian. With better weather conditions catches improved but with the re-appearance of the local fishing fleets prices fell. A great part of October was occupied in the 19th voyage to Karwar for gol but this was almost fruitless. In November the local market was glutted so the time was considered suitable for a trip to Karachi which lasted 16 days (voyages 24 to 26). Results were better on return to Bombay. In the middle of January another trip to Karachi was made (voyages 30 and 31) but this was less successful than before and had to be curtailed owing to damage by coral to the nets. After three good trips near Bombay a final visit (voyages 35 and 36) was made to Karachi. The results of all 36 voyages are

summarised in the following statements. As a separate report on the trawling operations is being prepared, I shall not discuss in detail these statements.

*Catch per hour's trawling and per hour's absence from port.*

| Voyage. | Absence from port. | Period of actual trawling. | A.                         |                                |             |        | B.                                  |                                |             |        |
|---------|--------------------|----------------------------|----------------------------|--------------------------------|-------------|--------|-------------------------------------|--------------------------------|-------------|--------|
|         |                    |                            | Catch per hour's trawling. |                                |             |        | Catch per hour's absence from port. |                                |             |        |
|         |                    |                            | Rays.                      | Dogfish, Shark, Saw fish, etc. | All others. | Total. | Rays.                               | Dogfish, Shark, Saw fish, etc. | All others. | Total. |
|         | Hours.             | Hours.                     | Lbs.                       | Lbs.                           | Lbs.        | Lbs.   | Lbs.                                | Lbs.                           | Lbs.        | Lbs.   |
| I       | 50                 | 24                         | 10                         | 4                              | 42          | 56     | 5                                   | 2                              | 20          | 27     |
| II      | 83                 | 31                         | 27                         | 4                              | 27          | 59     | 10                                  | 2                              | 10          | 22     |
| III     | 73                 | 36                         | 47                         | 6                              | 53          | 105    | 23                                  | 3                              | 26          | 52     |
| IV      | 63                 | 50                         | 27                         | 4                              | 73          | 105    | 22                                  | 3                              | 58          | 83     |
| V       | 128                | 110.5                      | 86                         | 11                             | 93          | 190    | 74                                  | 9                              | 80          | 164    |
| VI      | 92                 | 76.5                       | 65                         | 21                             | 119         | 205    | 54                                  | 18                             | 99          | 171    |
| VII     | 35                 | 14.75                      | 67                         | 1.4                            | 189         | 251    | 28                                  | 1                              | 80          | 106    |
| VIII    | 32                 | 11.25                      | 30                         | 3                              | 25          | 58     | 11                                  | 1                              | 9           | 20     |
| IX      | 30                 | 9                          | 50                         | 7                              | 47          | 104    | 15                                  | 2                              | 14          | 31     |
| X       | 75.5               | 62.5                       | 25                         | ..                             | 102         | 127    | 20                                  | ..                             | 84          | 104    |
| XI      | 54                 | 43.25                      | 29                         | 1                              | 133         | 163    | 23                                  | 1                              | 106         | 130    |
| XII     | 19                 | 4                          | 35                         | 2                              | 35          | 72     | 7                                   | 4                              | 7           | 15     |
| XIII    | 26.5               | 16.25                      | ..                         | ..                             | ..          | 9      | ..                                  | ..                             | ..          | 6      |
| XIV     | 49                 | 40.75                      | 36                         | 9                              | 45          | 90     | 30                                  | 7                              | 38          | 75     |
| XV      | 104                | 42                         | 17                         | ..                             | 42          | 59     | 7                                   | ..                             | 17          | 24     |
| XVI     | 75                 | 65                         | 55                         | 7                              | 59          | 121    | 48                                  | 6                              | 51          | 105    |
| XVII    | 70.5               | 52.5                       | 30                         | ..                             | 91          | 121    | 22                                  | ..                             | 68          | 90     |

| Voyage.                                 | Absence from port. | Period of actual trawling. | A.                         |                                   |             |        | B.                                  |                                   |             |        |
|-----------------------------------------|--------------------|----------------------------|----------------------------|-----------------------------------|-------------|--------|-------------------------------------|-----------------------------------|-------------|--------|
|                                         |                    |                            | Catch per hour's trawling. |                                   |             |        | Catch per hour's absence from port. |                                   |             |        |
|                                         |                    |                            | Rays.                      | Dogfish, Shark,<br>Saw fish, etc. | All others. | Total. | Rays.                               | Dogfish, Shark,<br>Saw fish, etc. | All others. | Total. |
|                                         | Hours.             | Hours.                     | Lbs.                       | Lbs.                              | Lbs.        | Lbs.   | Lbs.                                | Lbs.                              | Lbs.        | Lbs.   |
| XVIII ..                                | 74                 | 42·25                      | 18                         | 7                                 | 86          | 111    | 10                                  | 4                                 | 49          | 63     |
| XIX ..                                  | 188                | 44·75                      | 33                         | ..                                | 25          | 58     | 8                                   | ..                                | 6           | 14     |
| XX ..                                   | 73                 | 57·75                      | 8                          | 4                                 | 48          | 60     | 7                                   | 3                                 | 38          | 47     |
| XXI ..                                  | 68                 | 53·25                      | 20                         | ..                                | 57          | 77     | 16                                  | ..                                | 45          | 61     |
| XXII ..                                 | 89                 | 52·5                       | 21                         | 10                                | 83          | 114    | 12                                  | 6                                 | 49          | 67     |
| XXIII ..                                | 99                 | 77                         | 12                         | ..                                | 42          | 54     | 10                                  | ..                                | 32          | 42     |
| XXIV ..                                 | 135·5              | 59·25                      | 3                          | 8                                 | 80          | 92     | 1·4                                 | 3·5                               | 35          | 40     |
| XXV ..                                  | 56·5               | 46                         | 8                          | 8                                 | 145         | 154    | 6                                   | 6                                 | 118         | 124    |
| XXVI ..                                 | 71                 | 11·5                       | 8                          | 28                                | 127         | 164    | 1                                   | 5                                 | 20          | 26     |
| XXVII ..                                | 120                | 86                         | 45                         | 4                                 | 83          | 132    | 32                                  | 3                                 | 59          | 94     |
| XXVIII ..                               | 64                 | 40                         | 48                         | 5                                 | 76          | 130    | 30                                  | 3                                 | 48          | 81     |
| XXIX ..                                 | 118                | 70·75                      | 16                         | 5                                 | 58          | 79     | 9                                   | 3                                 | 35          | 47     |
| XXX ..                                  | 88                 | 34·5                       | 6                          | 8                                 | 76          | 90     | 2                                   | 3                                 | 26          | 31     |
| XXXI ..                                 | 98                 | 35                         | ..                         | 13                                | 80          | 93     | ..                                  | 4                                 | 29          | 33     |
| XXXII ..                                | 72                 | 58·5                       | 33                         | 12                                | 121         | 167    | 27                                  | 10                                | 99          | 136    |
| XXXIII ..                               | 75                 | 55·5                       | 22                         | 9                                 | 95          | 127    | 16                                  | 7                                 | 70          | 94     |
| XXXIV ..                                | 74·5               | 53·5                       | 29                         | 14                                | 106         | 148    | 20                                  | 10                                | 76          | 106    |
| XXXV ..                                 | 114·75             | 50·5                       | 10                         | 8                                 | 115         | 133    | 4                                   | 4                                 | 51          | 59     |
| XXXVI ..                                | 113·5              | 61·5                       | 20                         | 16                                | 76          | 112    | 11                                  | 9                                 | 41          | 61     |
| Grand Totals and<br>General Averages... | 2,851              | 1,679                      | 30                         | 7                                 | 80          | 117    | 18                                  | 4                                 | 47          | 69     |

*Rate of gross earnings per hour's fishing and per hour's absence.*

| Voyage.     | Absence<br>from port. | Duration<br>of trawling. | Sum realised.       |                         |                                     |
|-------------|-----------------------|--------------------------|---------------------|-------------------------|-------------------------------------|
|             |                       |                          | For whole<br>catch. | *Per hour's<br>fishing. | Per hour's<br>absence<br>from port. |
|             | Hours.                | Hours.                   | Rs.                 | Rs.                     | Rs.                                 |
| I .. ..     | 50                    | 24                       | 230                 | 9·6                     | 4·6                                 |
| II .. ..    | 83                    | 31                       | 273                 | 8·8                     | 3·3                                 |
| III .. ..   | 73                    | 36                       | 581                 | 16·1                    | 8·0                                 |
| IV .. ..    | 63                    | 50                       | 814                 | 16·3                    | 12·9                                |
| V .. ..     | 128                   | 110·5                    | 2,260               | 20·5                    | 17·7                                |
| VI .. ..    | 92                    | 76·5                     | 2,120               | 27·7                    | 23·0                                |
| VII .. ..   | 35                    | 14·75                    | 350                 | 23·7                    | 10·0                                |
| VIII .. ..  | 32                    | 11·25                    | 75                  | 6·7                     | 2·3                                 |
| IX .. ..    | 30                    | 9                        | 165                 | 18·3                    | 5·5                                 |
| X .. ..     | 75·5                  | 62·5                     | 1,136               | 18·1                    | 15·0                                |
| XI .. ..    | 54                    | 43·25                    | 656                 | 15·1                    | 12·1                                |
| XII .. ..   | 19                    | 4                        | ....                | ....                    | ....                                |
| XIII .. ..  | 26·5                  | 16·25                    | ....                | ....                    | ....                                |
| XIV .. ..   | 49                    | 40·75                    | 429                 | 10·5                    | 8·8                                 |
| XV .. ..    | 104                   | 42                       | 340                 | 8·1                     | 3·3                                 |
| XVI .. ..   | 75                    | 65                       | 641                 | 9·9                     | 8·5                                 |
| XVII .. ..  | 70·5                  | 52·5                     | 480                 | 9·1                     | 6·8                                 |
| XVIII .. .. | 74                    | 42·25                    | 671                 | 15·9                    | 9·1                                 |
| XIX .. ..   | 188                   | 44·75                    | 59                  | 1·3                     | 0·31                                |
| XX .. ..    | 73                    | 57·75                    | 135                 | 2·3                     | 1·8                                 |
| XXI .. ..   | 68                    | 53·25                    | 114                 | 2·1                     | 1·7                                 |
| XXII .. ..  | 89                    | 52·5                     | 198                 | 3·8                     | 2·2                                 |
| XXIII .. .. | 99                    | 77                       | 210                 | 2·7                     | 2·1                                 |

| Voyage.                                 | Absence<br>from port. | Duration<br>of trawling. | Sum realised.       |                        |                                     |
|-----------------------------------------|-----------------------|--------------------------|---------------------|------------------------|-------------------------------------|
|                                         |                       |                          | For whole<br>catch. | Per hour's<br>fishing. | Per hour's<br>absence<br>from port. |
|                                         | Hours.                | Hours.                   | Rs.                 | Rs.                    | Rs.                                 |
| XXIV .. ..                              | 135·5                 | 59·25                    | 143                 | 2·4                    | 1·05                                |
| XXV .. ..                               | 56·5                  | 46                       | 283                 | 6·2                    | 5·0                                 |
| XXVI .. ..                              | 71                    | 11·5                     | 260                 | 22·6                   | 3·7                                 |
| XXVII .. ..                             | 120                   | 86                       | 863                 | 10·0                   | 7·2                                 |
| XXVIII .. ..                            | 64                    | 40                       | 517                 | 12·9                   | 8·0                                 |
| XXIX .. ..                              | 118                   | 70·75                    | 1,106               | 15·6                   | 9·4                                 |
| XXX .. ..                               | 88                    | 34·5                     | 200                 | 5·8                    | 2·3                                 |
| XXXI .. ..                              | 98                    | 35                       | 215                 | 6·1                    | 2·2                                 |
| XXXII .. ..                             | 72                    | 58·5                     | 1,008               | 17·2                   | 14·0                                |
| XXXIII .. ..                            | 75                    | 55·5                     | 1,001               | 18·0                   | 13·3                                |
| XXXIV .. ..                             | 74·5                  | 53·5                     | 732                 | 13·7                   | 9·8                                 |
| XXXV .. ..                              | 114·75                | 50·5                     | } 1,086             | 9·7                    | 4·8                                 |
| XXXVI .. ..                             | 113·25                | 61·5                     |                     |                        |                                     |
| Grand Totals and General<br>Averages .. | 2,851                 | 1,679'                   | 19,351              | 11·5                   | 6·8                                 |

51. The average monthly expenditure on running the trawler is shown below. In this no account is taken of depreciation, while repairs and renewals are also excluded as these were, for various reasons, exceptionally high in the case of the "William Carrick":—

*Monthly cost of maintenance.*

|                                       | Rs.   |
|---------------------------------------|-------|
| Pay of Officers and chief engineer .. | 2,960 |
| Wages of crew .. ..                   | 1,453 |

*Monthly cost of maintenance—contd.*

|                                                      |          | Rs.    |
|------------------------------------------------------|----------|--------|
| Stores, consumable .. ..                             |          | 733    |
| Stores, non-consumable .. ..                         |          | 463    |
| Coal (average monthly consumption<br>125 tons) .. .. |          | 4,742  |
| Ice .. ..                                            |          | 294    |
| Port dues .. ..                                      |          | 283    |
| Miscellaneous (water, godown rent,<br>etc.) .. ..    |          | 247    |
|                                                      | Total .. | 11,175 |

52. Coal was exceptionally high in price during the earlier part of the operations, but even at present rates and with Indians trained to take the place of Europeans the cost of maintenance of a trawler of the Castle type cannot be met by sales of fish at current market rates. The reduction that might be effected by training Indians to replace Europeans is not easily calculable. The Indian crew were more than twice the numbers employed in Europe, but it was impossible, owing to the more trying climatic conditions, to keep them at sea each month for more than half the period that a trawler keeps the sea in European waters. Over 41 weeks actual trawling the average time spent at sea was three days (of 24 hours) per week. In England the trawling crews get an average of one night ashore per week and it is common for trawlers to keep the sea for a fortnight before returning for two nights to port. At Bombay conditions reduced the length of voyages to an average of 80 hours and after each voyage at least two nights had to be spent in port. Before trawling can be established in Bombay the establishment of cold storage is essential and there must be special facilities for rapid coaling, supplying ice and stores, and unloading catches. Trawling at the intensive rate practised in Europe could be maintained only by keeping spare staff to give all hands frequent leave.

53. Finally, a trawling venture could not succeed without a change in the mediæval conditions under which the local fish market

is conducted. There is also a great deal to be done in the way of popularising little known species of edible fish. A large part of the fish consuming public is apt to think of trawling in terms of pomfret. But the percentage of pomfret obtained by the trawler over all voyages was less than 4 per cent. by weight. Nor is the pomfret so profitable a fish to sell as some people might conclude from their household accounts. The pomfret is dear in June, July and August when the highest price fetched was 16 annas 10 pies per lb. This fell to 2 annas 1 pie in November, while the average for all sales was 7 annas per lb. Karel, palu and tambusa, all good edible fish constituting  $12\frac{1}{2}$  per cent. of the total catch, fetched less than 2 annas per lb. on the average. After pomfret the best selling fish was the ravas or salmon which fetched 6 annas per lb. but constituted only 1.7 per cent. of the catch. The gol, making 14 per cent. of the catch, was more remunerative at  $4\frac{1}{4}$  annas per lb. The most abundant fish is the ray or skate which composed on the average 25 per cent. of the total catch. It is so little esteemed locally that it sold on the average at the rate of 100 lbs. for a rupee. Even at this rate large quantities could not be sold at all. At first they were "dumped" at sea, but subsequently they were handed over free to the Army Department for use as an extra ration to troops, who obtained over 9,000 lbs. in this way. Skate, which was at one time equally unsaleable in England, is now a popular cheap edible fish there and a trawling company, if it could arrange for regular supplies, might be able to arrange for the disposal of the inevitably large catches by army contracts.

54. It is unnecessary to discuss here the possibilities of a smaller type of trawler or of seine net fishing with vessels driven by power. Although the outlook for commercial trawling in the Indian ocean is meantime not hopeful, it is unfortunate that the experiment could not have been continued a little longer for the guidance of future enterprise. Unfortunately, after it was launched, prices of coal and other supplies and of personnel rose to their extreme limits and there was no counterbalancing change in the fish market. This coincided

with the occurrence of Government's financial difficulties from similar causes. At a more prosperous time Government could probably have carried on the experiment some time longer at a cost less than that involved when operations were brought to a close. In the circumstances of the time there was therefore no alternative to closure.

55. It is satisfactory to record that everything which previous arrangement and foresight could provide was done to ensure success and no part of the failure can be ascribed to lack of adequate organisation. The officers and crew worked splendidly. The fishing results have been carefully compiled by the Marine Biologist and will be published later. Mr. Hefford's administration of the operations was excellent, and his head clerk, Mr. S. Y. Anandkar, deserves to be mentioned for the zeal and efficiency with which he assisted in the administrative and other work.

56. *Other Fisheries Work.*—The Marine Biologist visited Karachi in May for further local enquiries and had under enquiry the depletion of the pearl mussel fishery in the Thana creek. The depletion is probably due to over fishing. In the time at his disposal it has not been possible to ascertain the life conditions of the mollusc. He has also collected through the Salt Department and the Collector of Customs, Karachi, fishery statistics and intelligence as a basis for studying the fishing industry and the seasonal movements of the fish.

57. The Superintendent of Fisheries, Mr. T. J. Walke, assisted in trawling operations during the monsoon and returned to Karwar in September in order to start fish oil and guano operations. The sardine season was a complete failure and nothing could be done. Before the end of March, when his appointment was abolished, the Superintendent made 127 visits to fishing yards in the Ratnagiri and Kanara sub-divisions. Information of fish catches was collected and details of measurements, stomach contents, roe, etc., were recorded for the use of the Marine Biologist. Agriculturists at several places have adopted his advice for the utilisation of fish guts for manurial purposes. Experiments were again made in smoking

and pickling fish but could not be concluded before the closing of his office. He also made enquiries about the requirements of matee bark in Kanara for tanning nets, and the Collector has been requested to make arrangements for supply from forest areas. Much time and trouble were spent in assisting the Assistant Registrar of Co-operative Societies to form co-operative societies of fishermen but, though the men appeared anxious to form societies, the influence of local savkars could not easily be overcome. Two societies were actually registered but could not be brought into working order without the services of the Salt Department's bandar karkuns and the monsoon had set in before these were allowed. The difficulty of introducing innovations amongst the fishing classes has been exemplified in South Kanara where the yard regulations of the Madras Fisheries Department led to a general strike.

58. The year virtually marks the end of the fisheries section for, in December, the Marine Biologist will revert to the Ministry of Agriculture and Fisheries in England. It was easy for critics previously to ask what Government had done for the fishing industry ; it was apparently even easier for them to criticise every innovation and improvement which Government attempted to introduce when the industry was taken in hand. The fishermen resented attempts to introduce cleanliness into fish curing yards as an invasion of private rights. It is all the more a pity that, after the ground had been explored and partially broken, the need for retrenchment should render infructuous the efforts already made. I am hopeful however that the Commissioner of Customs, Salt and Excise will take up the work on fish oil and guano for which Mr. Walke had made careful preparations.

### *Engineering Workshops, Dapuri.*

59. These workshops were transferred from the Public Works Department at the end of 1919 and are still run on their original lines. Their circumstances are peculiar. They were originally intended to carry out repairs and other works for the Public Works

Department but after their transfer to this Department the obligation on Executive Engineers to send their work to Dapuri was removed. The position now is that, prices, quality and other circumstances being equal, Public Works Department Officers are required to give preference to the Dapuri workshops over private workshops. At the same time the Dapuri workshops have not entire freedom in preparing estimates and therefore in competing with private enterprise for Government orders. Further they are not allowed to compete with private enterprise by accepting outside orders without obtaining special sanction in each case. Their scope is therefore distinctly cramped.

Attached to the workshops but separately organised for accounts purposes is a store.

60. The workshops were organised under war conditions and at the outset were equipped with what plant and tools were available at the time. At the date of their transfer to the Industries Department they had not emerged from their improvised condition. In 1919 a good selection of modern machines was purchased from the Ministry of Munitions, and since then the shops have been overhauled and extended, and with a new foundry, a new fitting shed and an improved fitting shop are now capable of carrying out a wide range and a large volume of work.

61. It was feared that last year would be a bad one for the workshops. In the previous year the overhauling of the Surat distillery brought Rs. 80,000 worth of orders to the shops but during last year there were only three orders of over Rs. 2,000 each. At the outset Public Works Department patronage was partially lost and in any event, owing to the reduction in its grants, this department was not expected to have much work to give. If the distillery work is excluded orders actually increased, however, from 336 in 1920-21 to 733 in 1921-22, while the increase in the value of the work done was 50 per cent. Without compulsion the services of the workshops are in increasing demand although the rates charged have not been altered.

62. Arrangements were made during the year to close the workshop of the Agricultural Engineer and to undertake at Dapuri the work formerly carried out at this workshop. Formal orders are, however, still awaited.

63. According to the accounts presented in his annual report by the Executive Engineer in charge of the workshops there was a turn-over in the workshops and store combined of Rs. 2,66,009 involving a loss of Rs. 29,000 as compared with a loss of over Rs. 30,000 in the previous year on a turn-over of Rs. 3,68,000. The loss is regrettable but many commercial concerns can show no better results at the present time.

64. The increased turn-over in the previous year was due to the large issues from the store. This store was designed originally to meet Public Works Department demands and when it was transferred to the Department of Industries in 1919 it contained a very mixed lot of plant and materials, a good deal of which was valued in the books at prices which soon became out of date. This caused difficulties in inducing Public Works Department officers to take plant and materials from the stores in preference to buying afresh. The idea of acting as a Public Works Department supply agency was never entertained by the Industries Department but the task of getting rid of *ex*-Public Works Department stores has involved Dapuri in heavy writes off. The stores are being gradually reduced to dimensions suitable for the workshops only.

65. I give the estimated loss of Rs. 29,000 during the past year with some reservation, as it is not easy to draw up a satisfactory profit and loss account from the existing accounts system. A great deal of trouble has been expended in trying to improve matters and the system was fully examined during the year under report by Messrs. Price, Waterhouse and Company, Chartered Accountants, who submitted a lengthy report with proposals for introducing a new quasi-commercial set of books. I have however suspended consideration of their report as I understand that Government have other proposals in view for these workshops which may affect the accounting.

66. Nevertheless considerable economy has been effected even under the present system. Shortly after the workshops were transferred a demand was made for six more clerks and an additional overseer. This demand was not only found unnecessary but reductions have been made during the last year in the clerical, menial and other staff to the extent of Rs. 8,650 annually in addition to reducing pumping charges by Rs. 1,800—a total saving of overhead charges amounting to Rs. 10,450 annually. Coolies have also been reduced, and a further saving of Rs. 2,000 annually effected. Further reductions are not impossible and should be practicable in the accounts department but the chief need of the moment is not more retrenchment but more work so that all overhead charges may be fully recovered. More work can be secured if the workshops are recognised in practice, as they are in name, as the *central* workshops of Government for all departments.

As all new works have now been completed the services of an overseer have lately been dispensed with. Till now two-fifths of the overhead charges have been debitable to original works. In future the workshops will bear the whole of the overhead charges.

67. In his report (Appendix A) the Deputy Director has suggested that the works could now be managed by a single European officer. But if full use is made of the works by Government departments, as has not been the case hitherto, it is unlikely that, in the peculiar circumstances in which work has to be done for Government departments, the Works Manager could adequately supervise the increased output and also carry on the increased correspondence and other administrative work. As it is, an appreciable portion of the Deputy Director's time has been given to the Workshops though no part of his pay is reckoned as overhead charges. The Executive Engineer may be dispensed with under an extension of this arrangement but this would merely shift administrative control and disguise its cost.

68. Three graduates in mechanical engineering are under training at the Workshops and there are about forty ordinary

trade apprentices for whom a schoolmaster is provided. Their number fell in July last owing to new factory legislation. The training of graduates and apprentices can only be fully undertaken provided work is plentiful and this constitutes another reason for making it compulsory on all Government departments to use the Workshops to the full extent possible.

69. *Experimental work*.—The button making machinery has proved successful and boys are now under training to operate it. It wants “balancing” to some extent and it will take a few more months before commercial results can be estimated. The rosha grass oil plant is still under investigation. An entirely new design has been obtained from Glasgow and if this is adopted the plant will be made by the firm supplying the design. Work on an experimental brick making machine which was taken up at the instance of the Public Works Department has been suspended for lack of funds. A vertical frame saw with timber construction has been made to a special design and will shortly be tried.

### *Commercial and Industrial Intelligence.*

70. An incomplete but representative list of enquiries received during the year is given in Appendix B, and shows the general nature of the enquiries received. The enquirers are not always modest folks but if they are trying in the range and extent of their enquiries they are flattering in attributing to the department a first approximation to omniscience. The range of subjects to be treated is, however, very considerable and brings the department into working co-operation with nearly every other Government department. The subject of mines and minerals was transferred during the year from the Director of Agriculture. A full enquiry was made into the possibilities of industrial alcohol and the difficulties of makers of perfumes and spirituous medicinal preparations were represented to Government with partial success. In conjunction with the forest department, work has been done in developing forest resources for the manufacture of paper pulp, turpentine, rosin, buttons, power alcohol, bobbins,

rosha grass oil and matches. A collection of samples of foreign textiles sold in Australia was made available to Bombay mills while the Bombay Millowners' Association accepted and carried out a suggestion for preparing a classified list of local output. Information regarding local manufactures was supplied to the Controller of Contracts and other Government and private enquirers. Assistance and information has been given regarding the provision of railway wagons and railway sidings and the adjustment of freight rates. Closer relations with the Co-operative Department has been attained through producers' societies and two or three schemes for productive co-operation are now under examination. Till last year the lack of a local Test House was frequently felt but so far as this would be useful to the public it has been amply met in the last two years by private enterprise in Bombay. Of miscellaneous matters to which attention was paid mention may be made of the need of revising recent Government orders so as to place the standardisation of weights and measures on a sound scientific and administrative basis.

Receipts of correspondence and official references during the year were 7,371 as compared with 7,049 in 1920-21 and 5,959 in 1919-20. Letters issued were practically the same, viz.,—7,358.

### *Concessions.*

71. *Turpentine and rosin manufacture.*—During the year a concession was granted on the advice of the Advisory Committee to the Eastern Development Corporation for the tapping and collection of the oleo-gum-resin of *Boswellia Serrata* for the manufacture of turpentine and rosin. A preliminary license over a limited area for five years is convertible into a license for the whole of Khandesh for twenty-five years renewable for another twenty-five years. Royalty is taken in the shape of 40 per cent. of the profits.

*Paper pulp.*—At the close of the year a concession in Khandesh for the manufacture of paper pulp from grass was under examination and a recommendation regarding terms has since been submitted by the Advisory Committee to Government.

*Magnesium chloride.*—Since 1916 over two lakhs of rupees have been received as royalties for the manufacture of magnesium chloride. Owing to the fall in the price the royalty terms are now under revision on a profit sharing basis.

### *Exhibitions.*

72. The Department participated in the British Industries Fair, London, in February-March 1922. The samples sent included carpets, silk; embroidered trimmings, and carved sandalwood. Owing to the depression in trade no orders were booked. The expenditure incurred will be practically covered by the sale of samples.

The All India Weaving Exhibition at Patna in which the department participated has already been mentioned. It has been arranged to demonstrate at the Red Cross Fete at Bombay in December the work which is done by the department for the improvement of handweaving.

Participation in the British Empire Exhibition in 1924 is under consideration.

### *Technical Education.*

73. The subject of technical education is under the administration of the Department of Public Instruction but the Department of Industries maintains touch through the Director's membership of the Board of the Victoria Jubilee Technical Institute, the Committee of Direction for Technical Education and the Advisory Committees of the College of Engineering and the Royal Institute of Science. Technical scholarships are also awarded on the advice of the Department of Industries which assists and advises the scholars during and after their training. At present four state technical scholarships are given for study abroad. One of these was awarded in 1919 for the study of sugar technology at the Audubon Sugar School of the University of Louisiana. The holder of this scholarship, having successfully completed his college course, is now on tour in the West Indies, Hawaii and Java where facilities for the study of factory methods have been arranged. During the year

three scholarships became vacant and, on the advice of the Advisory Committee, two were awarded for the study in Great Britain of tanning and of bleaching and dyeing. The remaining vacant scholarship has been reserved by Government for the study of actuarial science. The present system of maintaining a fixed maximum number of scholars has the disadvantage that vacant scholarships occur at irregular and not easily calculable intervals. Proposals for awarding two scholarships *annually* are under the consideration of Government.

74. Three scholarships in technical chemistry at the Indian Institute of Science, Bangalore, were awarded a year ago and were recently renewed for another year. Three new scholars were also appointed at the close of the year under report. One will assist Dr. G. Fowler at the Indian Institute of Science in research on a lactic acid forming yeast on which work was begun, in connection with the investigation of a ghee substitute, by Mr. A. F. Yuill, author of the departmental bulletin on the Vegetable Oil Industry of the Bombay Presidency. A second scholar will investigate the manufacture of casein, glues and cements. A third scholarship in pottery was not taken up.

Scholarships were offered for the study of electrical engineering at the Indian Institute of Science, Bangalore, but none of the applicants were considered to have sufficiently good qualifications and no award was made.

75. In 1919 the Advisory Committee recommended that travelling scholarships should be available for persons actually engaged in industry to enable them to go abroad, not for purposes of theoretical study or even practical training, but to make such enquiries and observations as were likely to benefit Indian industry. During the year two travelling scholarships, each of the value of Rs. 5,000, were awarded to Messrs. B. J. G. Shastri and J. K. Chapadia who are engaged in the gold and silver thread industry at Surat. It is recognised that their enquiry, which they have already begun in England and on the continent, regarding improved mechanical means of manufacture

is not an easy one but they can hardly fail to get better results for the expenditure than Government could achieve by investigation and experiments in India. There has been a demand for a Government demonstration factory in this industry but, apart from the cost and other difficulties, no one has been able to suggest where instructors can be found capable of devising or teaching improved methods. It will therefore be specially interesting to follow the results of the enquiries of Messrs. Shastri and Chapadia in their own business and in the industry as a whole.

*Conclusion.*

76. The staff throughout has worked; on the whole, with efficiency. There is room for improvement in the office organisation but it is impossible to retain men on the prospects offered. There are seven posts for graduates in the office and in the last three years nine graduates have received a training in these posts and left afterwards to better their prospects. It is impossible to get full efficiency from such a changing staff. These conditions and a certain degree of uncertainty regarding the future of the whole department have not, however, materially affected its energies though they have checked initiative. I gratefully acknowledge the valuable assistance of the members of the Advisory Committee who have given up valuable time to the consideration of the subjects on which their advice was sought.

I have the honour to be,

Sir,

Your most obedient servant,

R. D. BELL,

Director of Industries.

## APPENDIX A.

## ANNUAL REPORT OF THE DEPUTY DIRECTOR OF INDUSTRIES.

Sir,

I have the honour to submit a report on the work of the Deputy Director of Industries for the year 1921-22.

2. \* \* \* \* \*

3. The Advisory Board to the Department of Industries has passed two resolutions since my return to the effect that the post of Deputy Director should be abolished and the decision of Government is awaited.

To work in a position of such uncertainty has caused me great anxiety and unhappiness."

4. The control of the Dapuri Workshops was restored to me early in the new year.

The second attempt to carry out woodwork and furniture at these works has again proved a failure.

5. Cheap but good woodwork cannot be undertaken at Dapuri until a full range of woodworking machines is installed.

Most of the operations now carried out so inefficiently by hand should be done on machines by trained men. The components of an article under construction, properly marked off, should be handed over to the joiners for fitting, glueing up and finishing. If this system is ever adopted, I believe woodworking will be a success.

6. By the end of the financial year new works at Dapuri were practically complete and the full energies of the staff can now be directed to work in the shops and to the needs of clients.

The works have always been carried on with difficulty owing to building alterations and the lack of a full range of machines.

The works are very well equipped for repair work and the production of parts of machinery, castings, etc.; and if sufficient orders are forthcoming they should pay their way.

7. A policy of reducing the stores to the smallest quantity possible has been instituted and all old and redundant stock is being sold off by auction.

8. Orders have been received to re-open a Tools and Plant Store for the Public Works Department.

9. The question remains to be decided whether the staff can be reduced further, and it seems probable now that new works are complete, that a single European officer with an Indian Assistant might be able to carry on the works and office.

10. The Gold and Silver Wire Drawing industry has been examined and unsuccessful attempts made to design a machine for producing square section spirals.

Experiments in preparing hard steel rolls have met with some success, but it is hoped to produce an article which will not require such frequent polishing.

The problem is to find a suitable grade of steel which will stand hardening and retain a highly polished surface.

11. Sawing logs into planks and scantlings by means of circular saws is wasteful and inaccurate and has led to many failures. Inserted tooth saws tried at Dapuri are more successful as they remain sharp for a longer period, but it is clear that the vertical frame saw is the correct type of machine. Unfortunately such frame saws are very costly when imported. A vertical frame saw has now been designed with timber construction and will shortly be tried at Dapuri. This saw should be popular as it is easy to make and the cost will be quite moderate.

12. Attention has been directed to the design of a cheap pumping set for small yields from wells. Progress has been made with a design of pump which promises to be cheap to make, but experience in work can alone prove whether it is to be satisfactory or not.

13. Opinion is slowly turning in the direction of utilising charcoal for the production of power in small suction gas producers.

It is hoped that before long the use of small gas engines and producers will become popular. Messrs. Kirloskar Bros. are taking up the manufacture of such plant and have already made several producers which are supplying gas to converted oil engines.

14. An investigation into the manufacture of chilled plough shares has demonstrated that the chilled shares made by Kirloskar Bros. are quite equal to those imported from England and the United States of America while the cost is half the amount paid for the latter.

15. A large number of problems submitted by industrialists have been investigated and information has been supplied in the majority of cases.

Owing to the state of trade, however, few new enterprises have been taken up seriously.

16. Investigations in the use of Bombay timbers for different purposes have been carried on in collaboration with the Forest Department, but no conclusive results are ready owing to the time required to obtain really seasoned timber from woods which are not in common use.

17. Assistance has been rendered to the Public Works Department in connection with mechanical engineering work when required. I have again been

placed on the Sanitary Board and attended an important meeting at Mahableshtar.

18. I attended the Handloom Weaving Exhibition at Patna and have attempted to find a suitable wood for making shuttles, but the investigation is incomplete.

19. A 15 b.h.p. oil engine was purchased for the Ratnagiri Industrial school and a visit was made to that institution. Plans for erecting the oil engine and setting up a number of machine and woodworking tools have been sent to the Superintendent, but in the absence of any definite programme of instruction in metal and woodwork with machines, it is rather doubtful whether the installation of power will be of much benefit to the students.

20. A set of button making machines has been designed, made and set up at Dapuri by Mr. Mustaphi who has had considerable experience of button making.

These machines are now producing buttons and it is anticipated that they will be turning out considerable quantities shortly when the workers are fully trained.

If successful, this demonstration plant should form the nucleus for an industry on this side of India as enormous quantities of "nut buttons" are now imported from Italy which might be made in India.

I have, etc.,

(Signed) G. H. THISELTON-DYER,

Deputy Director of Industries.

## APPENDIX B.

### COMMERCIAL AND INDUSTRIAL ENQUIRIES, 1921-22.

| Subject of enquiry. |                                                     |       | Number of enquiries, |
|---------------------|-----------------------------------------------------|-------|----------------------|
| 1.                  | Acetate of lime. Buyers of —                        | .. .. | 1                    |
| 2.                  | Acid Sulphuric. Manufacturers in India of —         | .. .. | 1                    |
| 3.                  | „ Oxalic. „ „                                       | .. .. | 1                    |
| 4.                  | Acids for dyeing. Literature on —                   | .. .. | 1                    |
| 5.                  | Agricultural implements and machinery. Imports of — | .. .. | 1                    |
| 6.                  | Ajwan Oil. Distilleries in India of —               | .. .. | 2                    |
| 7.                  | Alabaster. Sources of —                             | .. .. | 1                    |
| 8.                  | Alumina Sulphate. Consumption in Bombay of —        | .. .. | 1                    |
| 9.                  | „ Ferric. „ „                                       | .. .. | 1                    |
| 10.                 | Aluminum. Importers of —                            | .. .. | 1                    |

| Subject of enquiry.                                                               | Number of enquiries. |  |
|-----------------------------------------------------------------------------------|----------------------|--|
| 11. Aluminum sheets. Dealers in — .. ..                                           | 1                    |  |
| 12. „ wares. Manufacturers of — .. ..                                             | 1                    |  |
| 13. Antimony Sulphide. Producers of — .. ..                                       | 1                    |  |
| 14. Apprenticeship for pharmaceutical chemist .. ..                               | 1                    |  |
| 15. Artemesia. Dealers in — .. ..                                                 | 1                    |  |
| 16. Asbestos. Producers in India of raw — .. ..                                   | 1                    |  |
| 17. Bags (cotton) for tobacco manufacturers in South Africa. Suppliers of — .. .. | 1                    |  |
| 18. Bangles (glass). Dealers in — .. ..                                           | 1                    |  |
| 19. „ Enamelling for — .. ..                                                      | 1                    |  |
| 20. Barytes. Producers in India of — .. ..                                        | 1                    |  |
| 21. Bee Keeping. Information re — .. ..                                           | 1                    |  |
| 22. Belting-camel — hair and leather — Suppliers of — .. ..                       | 2                    |  |
| 23. Bersam seeds. Suppliers of — .. ..                                            | 1                    |  |
| 24. Bitumen. Sources of — .. ..                                                   | 1                    |  |
| 25. Bone Mill. Estimate for — .. ..                                               | 1                    |  |
| 26. Borax (indigenous). Suppliers of — .. ..                                      | 1                    |  |
| 27. Bottles. Manufacturers in India of glass — .. ..                              | 1                    |  |
| 28. Boxes. Manufacturers of special wood — .. ..                                  | 1                    |  |
| 29. „ Buyers for wood — .. ..                                                     | 1                    |  |
| 30. Brass sheet. Dealers in — .. ..                                               | 1                    |  |
| 31. Brass ware. Manufactures of — .. ..                                           | 1                    |  |
| 32. Brick plant. Estimate for — .. ..                                             | 1                    |  |
| 33. Bundling machines. Suppliers of — .. ..                                       | 1                    |  |
| 34. Button Making Machinery .. ..                                                 | 1                    |  |
| 34a. Burr Stones. Indian Sources of — .. ..                                       | 1                    |  |
| 35. Buttons. Manufacturers of thread — .. ..                                      | 1                    |  |
| 36. „ Machinery for and dealers in nuts for — .. ..                               | 1                    |  |
| 37. Calcium Chloride. Suppliers of — .. ..                                        | 1                    |  |
| 37a. „ Carbide. Imports of — .. ..                                                | 1                    |  |
| 38. Cambric. Suppliers of — .. ..                                                 | 2                    |  |
| 39. Canning fruits. Assistance for — .. ..                                        | 1                    |  |
| 40. Canvas. Manufacture of sail — .. ..                                           | 1                    |  |
| 41. Carborundum Powder. Sources and suppliers of — .. ..                          | 1                    |  |
| 42. Cardboard. Demand for — and particulars of the industry .. ..                 | 1                    |  |
| 43. Carding machinery for wool .. ..                                              | 1                    |  |
| 44. Casks. Information regarding manufacture, market prices, etc., of — .. ..     | 1                    |  |

| Subject of enquiry. |                                                                                           |       | Number of enquiries. |
|---------------------|-------------------------------------------------------------------------------------------|-------|----------------------|
| 45.                 | Catechu. Manufacturers of extract of —                                                    | .. .. | 1                    |
| 46.                 | Celluloid Industry. Information re —                                                      | .. .. | 1                    |
| 47.                 | Chalk. Producers of —                                                                     | .. .. | 1                    |
| 48.                 | Charcoal. Dealers in mordant —                                                            | .. .. | 2                    |
| 49.                 | „ „ „ wood —                                                                              | .. .. | 1                    |
| 50.                 | Chemicals. Manufacturers of aromatic —                                                    | .. .. | 1                    |
| 51.                 | „ „ Imports of —                                                                          | .. .. | 1                    |
| 52.                 | „ „ Manufacturers of — in the Bombay Presidency                                           | .. .. | 1                    |
| 53.                 | Chicory. Manufacturers of — in Bombay                                                     | .. .. | 1                    |
| 54.                 | China Clay. Suppliers of —                                                                | .. .. | 3                    |
| 55.                 | Chocolate. Exporters in Bombay of —                                                       | .. .. | 1                    |
| 56.                 | Cigarettes. Manufacturers in India of —                                                   | .. .. | 2                    |
| 57.                 | Cloth imports into Belgaum District                                                       | .. .. | 1                    |
| 58.                 | Cochineal. Sources and uses of —                                                          | .. .. | 1                    |
| 59.                 | Coffee-roasting factories in Bombay                                                       | .. .. | 1                    |
| 60.                 | Coir matting. Manufacture of —                                                            | .. .. | 1                    |
| 61.                 | Cotton. Suppliers of long staple —                                                        | .. .. | 1                    |
| 62.                 | Cotton Mills. General information re —                                                    | .. .. | 2                    |
| 63.                 | Crucibles. Manufacture of —                                                               | .. .. | 1                    |
| 64.                 | Enamel. Manufacturers of —                                                                | .. .. | 1                    |
| 65.                 | Enamel. Possibilities of — industry in India                                              | .. .. | 1                    |
| 66.                 | Envelopes. Machinery for making —                                                         | .. .. | 1                    |
| 67.                 | Explosives. Manufacturers in India of —                                                   | .. .. | 1                    |
| 68.                 | Felt industry. Estimate for starting —                                                    | .. .. | 1                    |
| 69.                 | Fire Works. Manufacturers in India of —                                                   | .. .. | 1                    |
| 70.                 | Flour Mills. Estimates for and prospects of —                                             | .. .. | 2                    |
| 71.                 | „ „ in Bombay. Names of —                                                                 | .. .. | 1                    |
| 72.                 | Fruit Preservation. Information re —                                                      | .. .. | 1                    |
| 73.                 | Fuller's Earth. Uses, sources and producers of —                                          | .. .. | 2                    |
| 74.                 | Furniture-Making. Literature on —                                                         | .. .. | 1                    |
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